Disease

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Rotations and Cotton Disease

David Nehl[1], Stephen Allen[2], Chris Anderson[1, 3]

[1]NSW Department of Primary Industries, [2]Cotton Seed Distributors [3]Cotton Catchment Communities CRC

Rotations are important to plant disease because they affect the survival and reproduction of plant pathogens and the biology and quality of soil. Disease is only one of several factors to consider when choosing a rotation sequence.

Alternaria leaf spot

Black root rot

Fusarium wilt

Seedling disease

SEEDLING DISEASE

(Caused by *Rhizoctonia and Pythium*)

Rhizoctonia occurs in all soils and multiplies on crop residues; particularly residues with a low carbon to nitrogen ratio, such as legumes (including woolly pod vetch). However, climatic conditions have the greatest impact on seedling disease.

Early incorporation of residues from cotton and legumes reduces carryover of *Rhizoctonia*.

Rotation with cereals is likely to decrease *Rhizoctonia* in cotton. (The strains of *Rhizoctonia* that attack winter cereals are different to those that attack cotton)

In crusting soils, cereal cover crops and/or standing stubble may improve emergence and establishment of cotton.

BLACK ROOT ROT

(Caused by *Thielaviopsis basicola*)

Black root rot is widespread in NSW and southern QLD. *Thielaviopsis* does not grow on crop residues and survives as long-lived spores in the soil. Each crop of infected cotton deposits more spores in the soil and the severity of black root rot increases according to the number of cotton crops, irrespective of rotations (except for biofumigation crops).

Woolly pod vetch and Indian mustard have a 'biofumigation' effect on *Thielaviopsis* (i.e. toxic to spores) when grown as 'green manures'. Incorporate biofumigation crops at least four weeks before cotton to minimise *Rhizoctonia*.

Rotation with cereals delays, but does not prevent, the build-up of black root rot. Two or more consecutive cereal crops can reduce the severity of black root rot in the following cotton crop.

Rotation with legume crops may increase black root rot.

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ALTERNARIA LEAF SPOT

(caused by *Alternaria macrospora*)

Alternaria leaf spot is ubiquitous in Australian cotton but seldom severe. Alternaria survives on cotton residues on the soil surface. Alternaria leaf spot at the pre-square stage is unlikely to cause later problems. Alternaria leaf spot affects mature cotton when it isstressed (e.g. premature senescence).

Carryover of Alternaria is reduced by incorporation of cotton residues between consecutive cotton crops and/or rotation with cereals.

VERTICILLIUM WILT

(caused by *Verticillium dahliae*)

Verticillium is widespread in much of NSW and southern QLD. Verticillium survives in infested cotton trash but does not multiply in crop residues. Verticillium wilt increases with the use of susceptible varieties of cotton.

Rotation with cereals may decrease the severity of Verticillium wilt.

FUSARIUM WILT

(caused by *Fusarium oxysporum f.sp.vasinfectum)*

Fusarium wilt is widespread in parts of QLD and NSW. Fusarium survives in infested cotton trash and may also multiply on residues from other crops.

Rotation with some crops may increase Fusarium wilt. Biofumigation increases the severity of Fusarium wilt and SHOULD NOT be practiced in fields where this disease is present.There is no evidence that any rotation crop will reduce the severity of Fusarium wilt. Retain cotton residues on the soil surface for as long as possible before incorporation. 'Best bet' option for infested parts of fields: sow cereal in standing stalks, pull and mulch cotton stalks and leave on surface, harvest cereal and burn stubble.

BENEFICIAL ORGANISMS - MYCORRHIZA

(a partnership between plants and beneficial fungi)

Mycorrhizal fungi (also known as AM, formerly VAM) are 'beneficial' fungi that colonise the roots of plants. The plant 'feeds' the fungus with sugars and, in return, the myc-orrhizal fungus supplies the plant with nutrients from the soil. Cotton is highly dependent on mycorrhizal fungi for uptake of P and Zn. A lack of mycorrhizal development can slow the growth of cotton seedlings. Cropping sequences are important to mycorrhizal fungi because they can only survive and reproduce on living plants. Mycorrhizal development in cotton will be adequate after rotation with cereals or legumes in either summer or winter. After a single season with either bare fallow or rotation with a non-mycorrhizal crop (eg. canola), there will usually be sufficient mycorrhizal fungi in the soil. Cotton is able to compensate for a slight lack of mycorrhiza. Bare fallow for more than one year or removal of top-soil (especially more than 40 cm) may result in a lack of mycorrhizal fungi, causing problems in the following crop. A cereal, legume or green-manure crop may restore sufficient mycorrhizal fungi for cotton.

For further information please contact:

NSW DPI Plant pathologists at the Australian Cotton Research Institute, Wee Waa Rd, Narrabri, 2390.

Chris Anderson ph 02 6799 2454 or chris.anderson@dpi.nsw.gov.au

Alison Seyb ph 02 6799 1528 or alison.seyb@dpi.nsw.gov.au

QDPIF Plant pathologists at Farming Systems Institute 203 Tor St, Toowoomba 4350

Linda Scheikowski ph 07 4688 1325 or linda.scheikowski@dpi.qld.gov.au

Linda Smith ph 07 38969538 or linda.smith@dpi.qld.gov.au